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PCT/GB 2003 / 0 0 0 1 9 4

INVESTOR IN PEOPLE

The Patent Office
Concept House
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NP10 8QQ

PRIORITY DOCUMENT

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I also certify that the attached copy of the request for grant of a Patent (Form 1/77) bears a correction, effected by this office, following a request by the applicant and agreed to by the Comptroller-General.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed J Evens.

Dated 10 March 2003

Patents Form 1/77

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1/77

21MAY02 E720110-1 C81053
P01/7700 0.00-0211603.6

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
South Wales
NP10 8QQ

1. Your reference
EAT PAT 4

2. Patent application number
(The Patent Office will fill in this part)
0211603.6
21 MAY 2002

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*
E.A. TECHNICAL SERVICES Ltd
9 RYDAL PLACE
CLITHEROE ROAD
CLITHEROE
LANCASHIRE
BB74JY

Patents ADP number *(if you know it)*
8306474001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention
COMPRESSOR WITH VARIABLE PRESSURE AND FLOW CONTROL

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Patents ADP number *(if you know it)*

	Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*
6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number	GB	0200991.8	17 Jan 2002

	Number of earlier application	Date of filing *(day / month / year)*
7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	0200991.8	

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
   c) any named applicant is a corporate body.
   See note (d))

YES

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	2
Claim(s)	0
Abstract	0
Drawing(s)	5

18th.

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. ~~I~~/We request the grant of a patent on the basis of this application.

Signature Ron Driver Date 19 MAY 02

12. Name and daytime telephone number of person to contact in the United Kingdom RON DRIVER 01200 441492

Warning

After an application for a patent has been filed, the Comptroller of the Patent Office will consider whether publication or communication of the invention should be prohibited or restricted under Section 22 of the Patents Act 1977. You will be informed if it is necessary to prohibit or restrict your invention in this way. Furthermore, if you live in the United Kingdom, Section 23 of the Patents Act 1977 stops you from applying for a patent abroad without first getting written permission from the Patent Office unless an application has been filed at least 6 weeks beforehand in the United Kingdom for a patent for the same invention and either no direction prohibiting publication or communication has been given, or any such direction has been revoked.

Notes

a) *If you need help to fill in this form or you have any questions, please contact the Patent Office on 08459 500505.*

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Compressor with Variable Pressure and Flow Control

Over the past few years hybrid engines have been proposed that were a combination of electric motor and a relatively small engine running at near maximum power whenever it was used. More recently there has been a move to a higher voltage electrical system, this permits engines to stop when the vehicle stops and then for the vehicle to initially move off using the electric motor.

In the present invention it is proposed to use a combination of supercharger, internal combustion engine and exhaust turbine. The exhaust turbine may drive a compressor or electrical generator or both. The enabling technology to permit efficient use of this combination of components is the use of a supercharger of the type and incorporating the features described in application PCT/GB01/03089 and 0200991.8 and the features described in the present invention. This type of supercharger allows the internal combustion engine's airflow to be controlled. It takes a full charge of air each revolution and evacuates air not required by pushing it out through the side disc metering orifice or orifices and allows the remainder to be discharged to the engine. In this manner the supercharger can supply air from ambient pressure to maximum supercharge pressure. This type of supercharger has compression efficiency comparable with the efficiency of the compression within an engine and an ability to accurately control airflow. This combination of components eliminates the need for expensive GDI, active combustion and VVT systems and with the exception of the supercharger needs only conventional components and fuel systems although using GDI or active combustion will increase the range of power. Adding a heat exchanger to the combination enables an engine of about 500 cc capacity to replace a 1.6-litre engine but with a considerably reduced weight and fuel consumption.
With the swept volume of the internal combustion engine known, a supercharger of this type can be designed for a particular supercharger maximum pressure and with the inlet control the supercharger output pressure can be varied from ambient to maximum pressure. Under these conditions the supercharger's outlet orifice or orifices position and size are constant and no variation is necessary.
Control of air mass flow per revolution is simply achieved by exposing more or less orifice area. Having apertures in the rotor disc, casing and an outer ring most easily does this. By sliding the outer ring over the interposed casing, more or less casing apertures are exposed, when the rotor disc apertures are adjacent the exposed casing apertures air can pass through if the position of the slide allows it. By this method pressure and mass flow can be controlled.
With the impending widespread introduction of higher voltage electrical systems in vehicles, auxiliary equipment will increasingly be driven by electric motors rather than directly by the internal combustion engine. Using an electric motor and varying the machine speed relative to the engine speed could additionally control the airflow in the present invention.

In application 0200991.8 the air outlet to the engine from the supercharger was through holes or slots as they became exposed to openings in the casing. With the development of gasoline direct injection (GDI), active combustion, electric drive, regenerative braking and the supercharger described in PC PCT/GB01/03089 and 0200991.8, internal combustion engines can be further reduced in size without reducing vehicle performance. With this combination an engine of 1.6 litre can be replaced by a 500 cc engine. An engine of 500 cc size, fulfilling the function of a 1.6

litre engine will have little or no throttling losses. For an engine with little or no throttling losses the supercharger described in PCT/GB01/03089 and 0200991.8 can be increased in efficiency by removing the ability to recover throttling losses. The ducts or transfer passages in the rolling piston that were used to provide flow from the supercharger to the engine provided a reservoir of air that was transferred back into the supercharger inlet during rotation and caused an efficiency loss of up to 10%. If these transfer passages are only required for the regulation of pressure from ambient upwards then their volume can be reduced and the supercharger efficiency increased. An alternative outlet to the engine must be provided though, and this must have less loss than the gain from the reduced transfer volume otherwise there would be no benefit.

One solution is to put a valve or valves in the casing between the plane of the piston side discs. The inside surface of the casing is curved which makes conventional poppet valves difficult to make and expensive. Reed type valves generally introduce some clearance volume (which is a parasitic loss) and some back flow back into the machine (a further parasitic loss). Spring loaded valves require the spring force to be overcome before they open and the air has got to be pressurised by this amount more than the engine requires and this is a further additional loss in efficiency.

In the present case at the time the reed valve is allowing back flow, the rolling piston is substantially covering the outlet orifice and in close conformity with the inside surface of the casing. This provides time for the closing reed valve inertia to be overcome by the pressure drop of returning air before any substantial flow has occurred, closure can be further assisted by a light spring load.

The present invention replaces the casing outlet passages of PCT/GB01/03089 and 0200991.8 to the engine manifold with a moving valve in the casing of the supercharger which opens as the pressure inside the supercharger increases beyond the pressure inside the engine manifold. The transfer passages in the rolling piston are reduced is volume to provide sufficient volume and pressure drop for return flow to the supercharger inlet only.

Fig 1 shows the feature which is reduced in length to provide the passage transfer volume reduction.

Fig 2 shows a diagrammatic representation of the position of the reed valve (two or more may be fitted).

Fig 3 shows the outlet holes that are deleted and typical reed valve positions.

Fig 4 shows a typical cast hinging vane.

Fig 5 shows the slide ring and some of the evacuation holes.

It will be obvious from the above description and reasoning for the outlet valves, that the same can be applied to the compression of refrigerants in a heat pump.

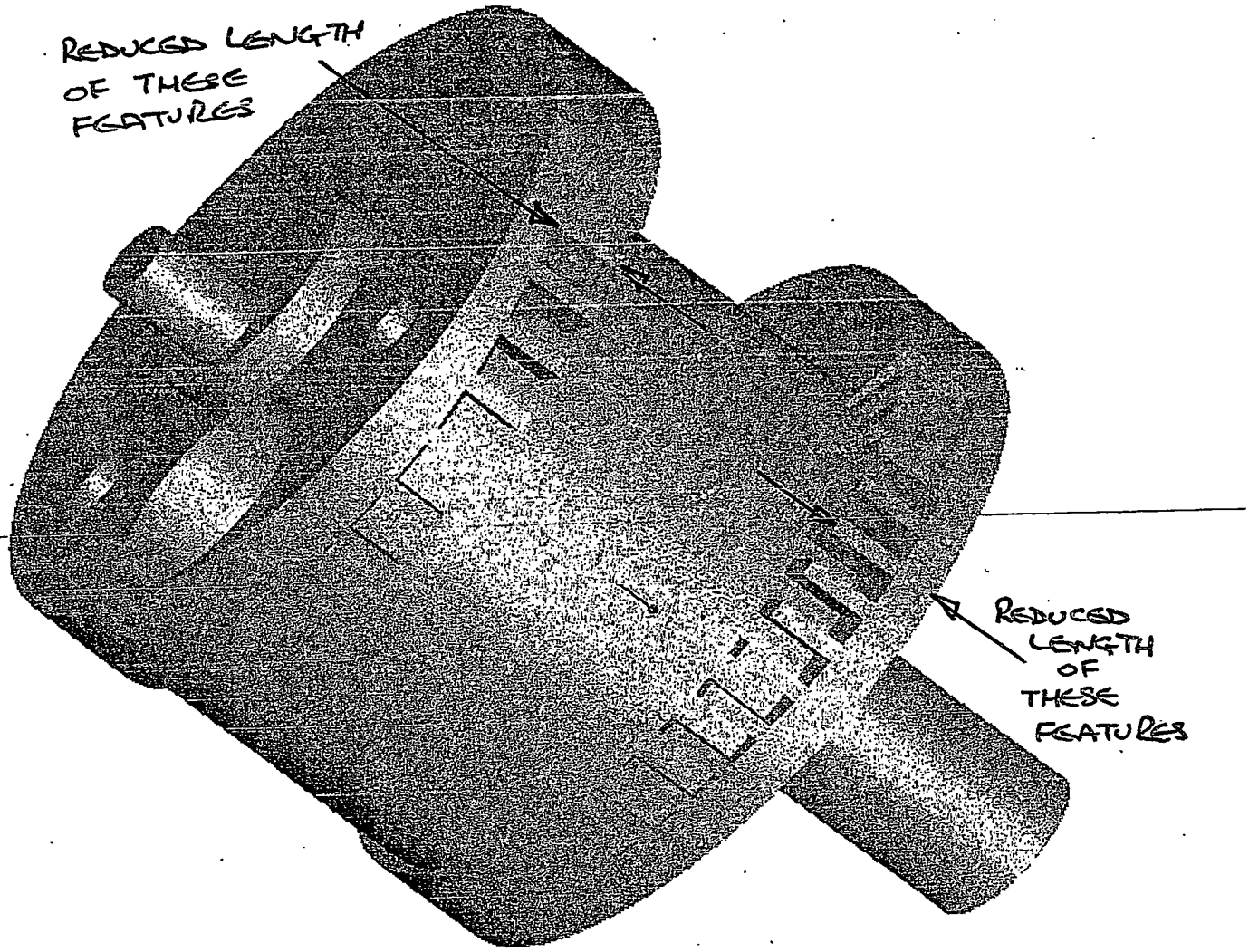

REDUCED LENGTH OF THESE FEATURES
REDUCED LENGTH OF THESE FEATURES

FIG 1

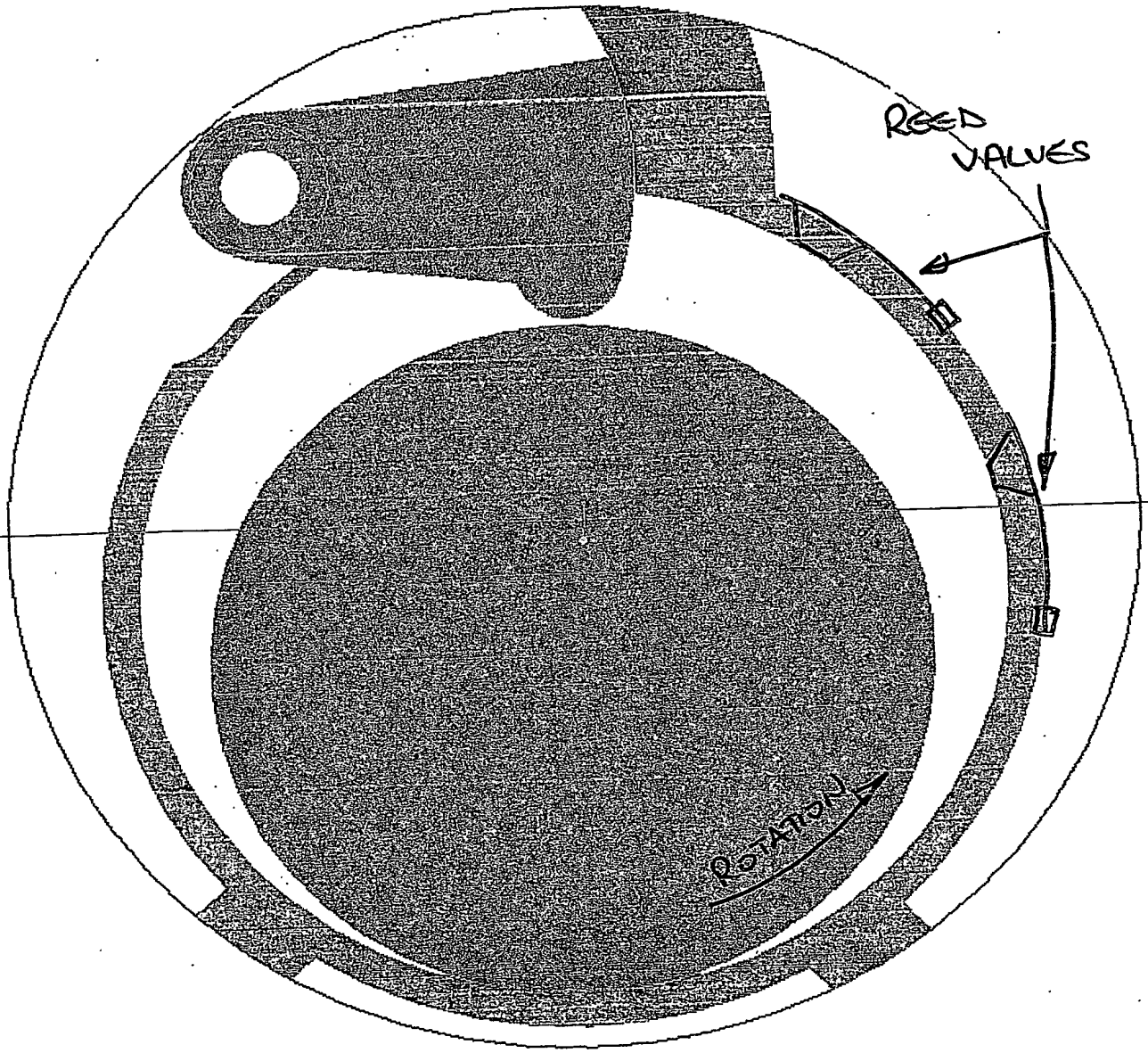


FIG 2

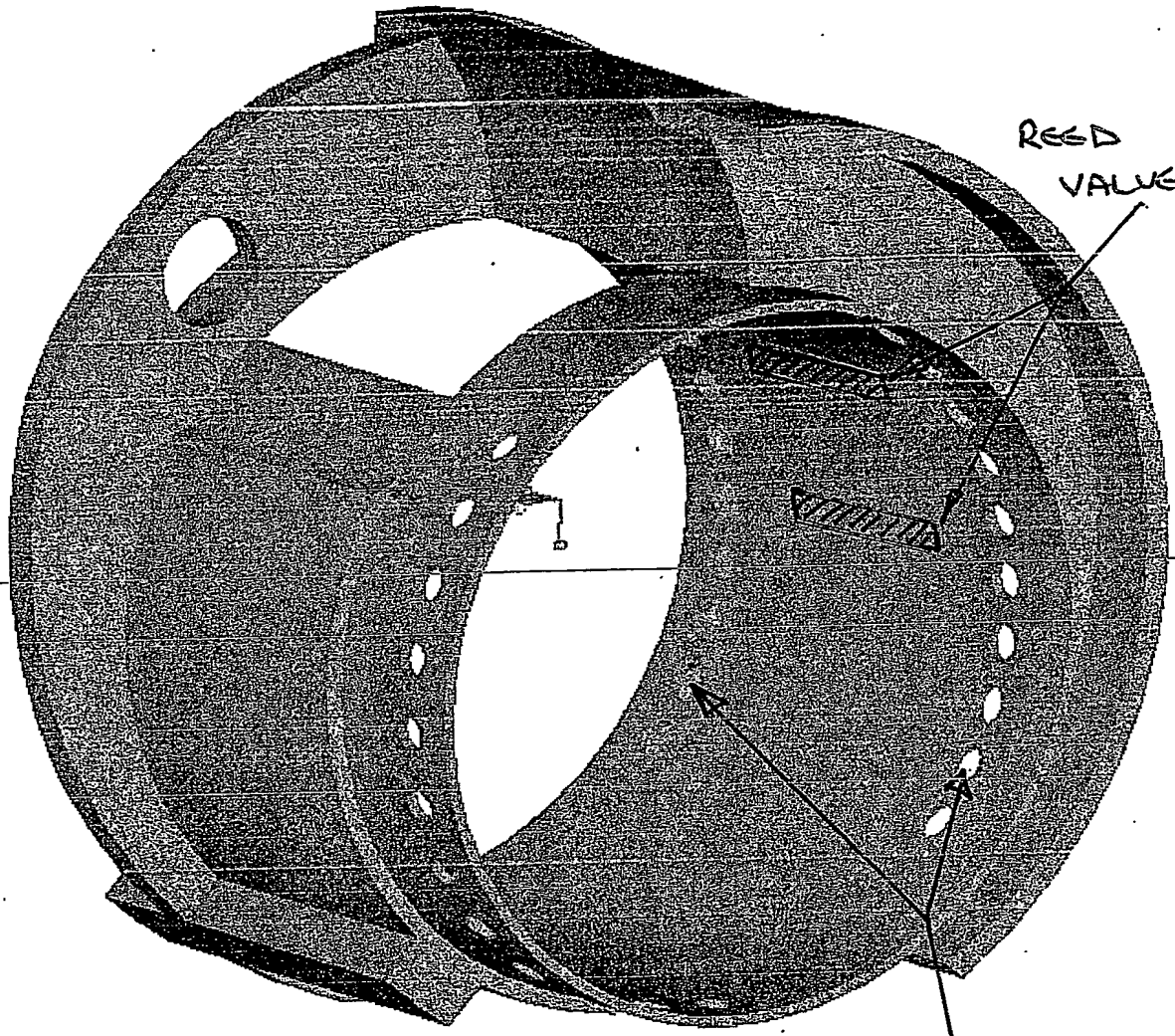

REED VALVES
HOLES TO BE DELETED AND REPLACED BY REED VALVES SHOWN

FIG 3

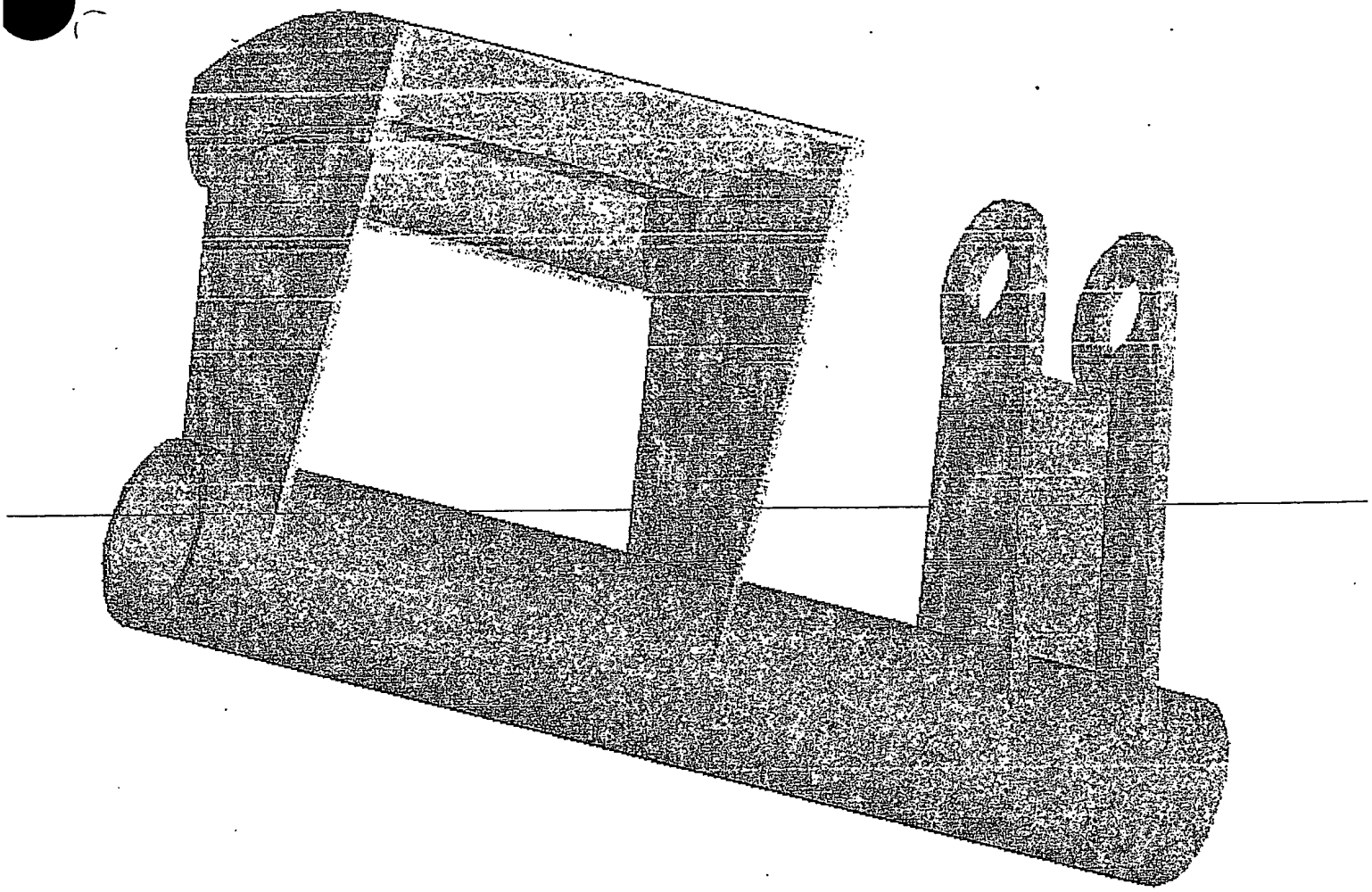


FIG 4

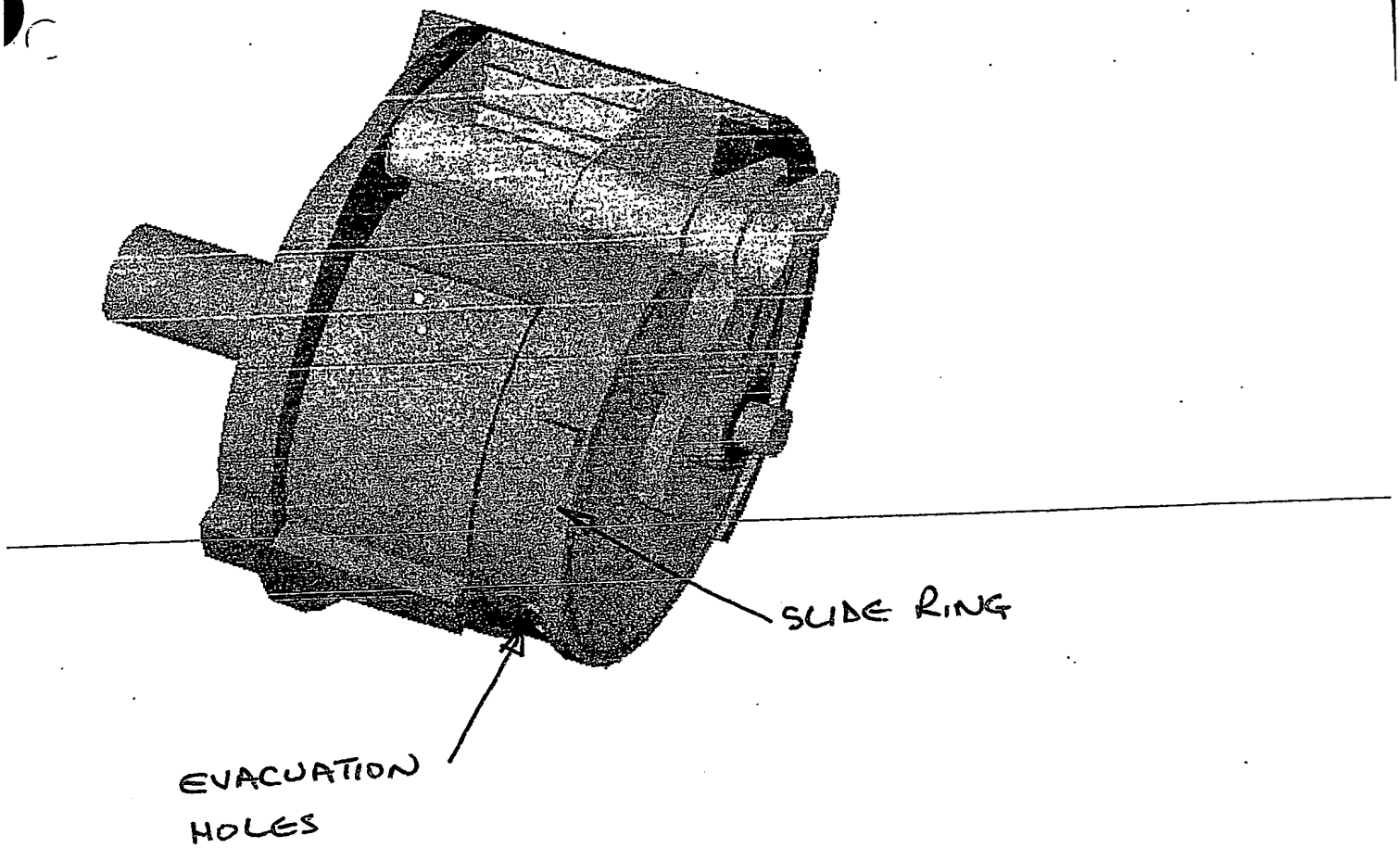
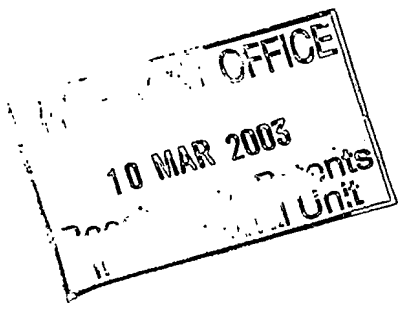


FIG 5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